CAPRA

Central America Probabilistic Risk Assessment

Evaluación Probabilista de Riesgos en Centro América

BELIZE

Task II
Inventory of Exposure and Vulnerability

Technical Report ERN-CAPRA-T2.1
INVENTORY OF EXPOSED ELEMENTS

ERN

Evaluación de Riesgos Naturales
- América Latina -
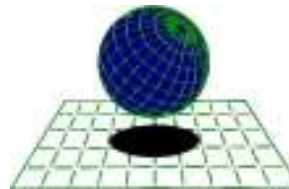#### Consultores en Riesgos y Desastres

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1 Assets exposure model

1.1 Model development

The information on exposure to natural phenomena concerns the inventory of real estate and infrastructure goods that can be affected, and it is expressed in terms of assets and population. It is an essential component in the risk analysis or evaluation, and the degree of precision of the results depends on its level of resolution and detail. There are different resolution levels, and when not enough detailed information is available, it is necessary to carry out approximate estimations that represent and give account of the inventory of assets exposed. This is referred as the *proxy* exposure model.

Figure 1.1 shows the general procedure carried out to develop a simplified model of exposed assets for the country.
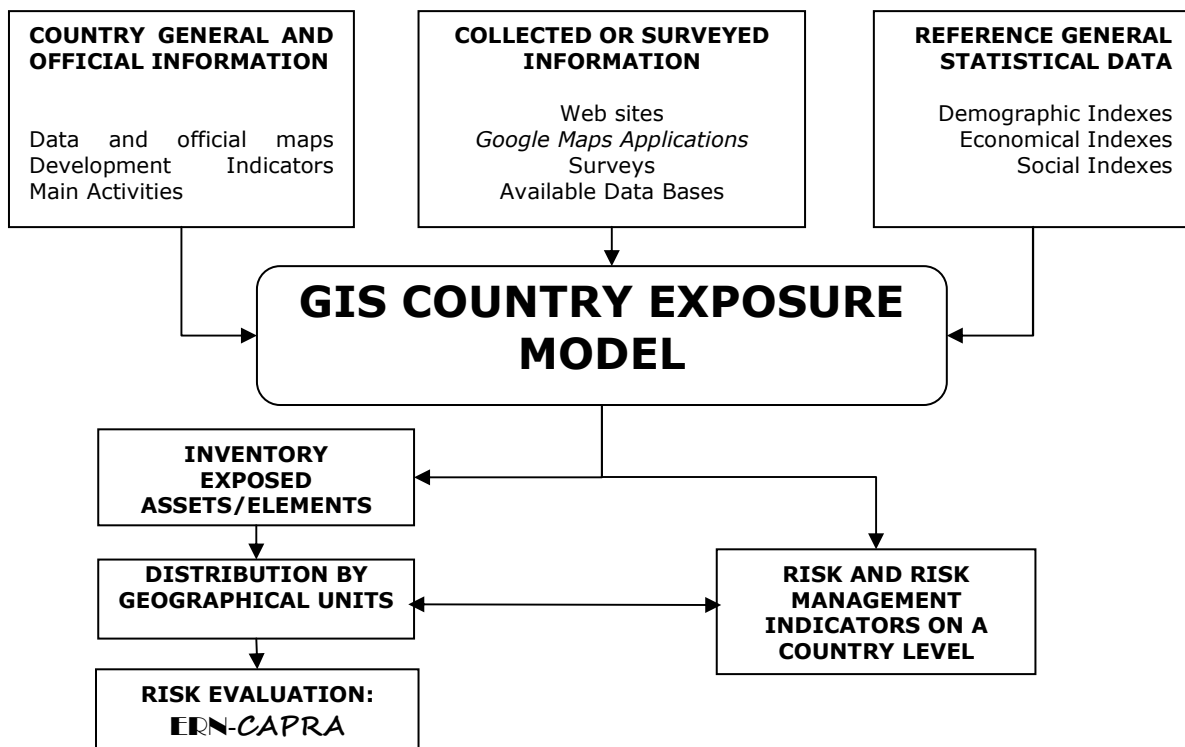

Figure 1.1
Simplified Model of Risk

The objective of the country's exposure model *proxy* is also to create a suitable distribution for the inventory, geographically, in such a way that it represents in general terms the

location of the assets and population exposed. The exposure is provided by the different components and their geographic location, the assigned restoration value, the estimated occupancy in terms of number of persons and the characteristics that allow the assignment of vulnerability functions to the different hazards with the purpose of estimating the risk. These bases of exposure are constituted by exposure indicators in terms of type of general country and city infrastructure, its economic appraisal and its human occupancy. The model also tries to provide information for the risk indicators formulation. The previous diagram of the Figure 1.1 illustrates the used model, in which the information for the model is stored in a database for its subsequent analysis and utilization.

The *proxy* exposure model requires the following definitions:

(a) Geographical and political division: the model is presented by means of a categorization in the following units:

    i. Departments or provinces (sub national units)

    ii. Municipalities belonging to Departments

    iii. Main cities belonging to municipalities

    iv. The municipalities in turn would also be separated in rural area and urban area.

    Note: the nomenclature changes from country to country.

(b) To characterize the different urban areas, a zoning assessment is set out in homogeneous zones in terms of infrastructure characteristics, population concentration, economic activity, socioeconomic conditions, topographic characteristics, and institutional importance, amongst others.

(c) In addition, when it is required for the analysis, the different rural zones of the municipalities can also be characterized. A zoning assessment in homogeneous regions can be set out for this purpose in terms of land use characteristics, density of development, population concentration, economic activity, and topographic characteristics amongst others.

In the case that it is required for the analysis, more detailed geographical areas can be used; for example, in the cities, the suburbs could be included depending on the information available.

1.2   General information of the country

1.2.1   *Setup of the database for risk analysis*

The exposure indicators are developed with the objective of representing the physical, economic and human information of a country or a city in geographical terms. Annex ERN–CAPRA-T2.1-1 presents the flowchart of proxy information. In order to develop these indicators, the following main categories are established:

- Developments in main cities
- Relevant urban infrastructure
- National infrastructure

Additionally, and when it is required in the analysis, rural infrastructure, particularly real estate, can also be considered. The methodology also allows for the inclusion of other exposed elements such as crops, environmental elements and in general any type of component susceptible of suffering any damage caused by the hazard events. The exposure indicators are developed by means of the spreadsheet annexed to this report: **Proxy-Belize.xls** (Annex ERN-CAPRA-T2.1-3)**.**

1.2.2 *Geographical description and political division of the country*

Belize is a country in Central America. It is borders by Mexico to the north, Guatemala to the west and the south and Atlantic Ocean to the east; it is divided into 6 political regions called District. Belize has an area of 22,966 km^2 and a population of 307,899 inhabitants. Figure 1.2 presents the political division and/or geographical distribution of the political regions, the district.

Figure 1.2
Country's political division (main regions and urban centres)

The geographical information collected is organized as shown in the Table 1.1. This table lists the country's main regions assigning a unique numerical code to each of the regions for identification purposes. In addiciton the Table 1.2 presents a list of the main urban centres of the country and their corresponding political sub national unit or district, each of these cities was selected according to population, socioeconomic status and coverage of public services.

Table 1.1
Distribution of country's sub national units

ID-Entid-Sub	ID District	District
1	1	Corozal
2	2	Orange Walk
3	3	Belize
4	4	Cayo
5	5	Stann Creek
6	6	Toledo

Table 1.2
Characteristics of main urban centres

ID City	City	ID District
1	Orange Walk Town	2
2	Belize City	3
3	San Ignacio/Santa Elena	4

1.2.3 *Population distribution*

The country has a total population of 274,587 inhabitants (projected to the year 2008, as included in the 2000 Census, with an annual growth rate of 2.4% by 2002 to 2005 and 2.1% for the subsequent years, according to ECLAC), with 45.4% of the population residing in urban centres (124,526 Inhabitants) and 54.6% in rural areas (150,061 inhabitants). The population is distributed as follows: 41% are children and adolescents, (112,506 inhabitants, 0-14 years), 54.8% are teenagers and adults (150,554 Inhabitants, 15 – 64 years), and 4.2% are persons older than 65 years (11,527 inhabitants, senior citizens).

Approximately 30.8% of the population (84,492 inhabitants) is economically active, with 23.8% of this being engaged in the agricultural sector, 10.4% in the industrial sector and 65.9% in the service sector.

Considering the different levels of development of the various segments of the population, a classification is established in accordance with the level of complexity or degree of development. This classification enables the differentiation of the various indexes used in the formulation of the complexity indicators such as urban population densities, prices per square meter of real estate, occupancy levels, types and costs of public services, etc.

1.3   Database of construction

1.3.1   *Methodology and scope*

With the objective of identifying the exposure value of the constructions in the country, a detailed inventory of the urban centres in each of the Districts was carried out. The most realiable parameter for this analysis is the official population reported in each of the political and administrative sub national units; that in this case they are districts. The official population and a series of indicators are therefore used to estimate the number and type of developments located in each of the urban centres. Subsequently, the same population information is used to establish hypothetical scenarios of occupancy for each building of the city being analized.

The types of buildings are estimated according to the diverse economic sectors present and the basic needs of the population, such as education and health facilities, amongst others. The composition (use) and size (m^2) of the constructions are estimated using the housing census classified in the following categories:

(a) Residential LP: low-income housing
(b) Residential MP: medium-income housing
(c) Residential HP: high-income housing
(d) Commercial
(e) Institutional
(f) Private Health
(g) Private Educational
(h) Public Health
(i) Public Educational
(j) Governmental

For the elaboration of this analysis, it is necessary to estimate the built areas per inhabitant, per type of uses and levels of complexity, the economic value of each square meter of development per type of use and level of complexity, and the occupancy level of each type of development in a certain given scenario, expressed in terms of square meter of built area per type of use and level of complexity.

Table 1.3 presents the range of urban population used by each level of complexity, and Table 1.4 presents the percentages of population for different income levels depending of each level of complexity. In this case, LP means low income poplation, MP medium income population and HP high income population. The information of poverty has been taken of "Poverty Assessment Report" for each district.

Table 1.3
Level of complexity

Level of Complexity	Population in the urban zone
High - 1	>50,000
Medium - 2	10,000 a 50,000
Low - 3	<10,000

Table 1.4
Poverty indicators

Economic capability	Population LP	Population MP	Population HP
High	25%	66%	9%
Medium	31%	64%	6%
Low	44%	52%	4%

The analysis of exposure of developments in urban centres was carried out for a total of 6 districts, with an overall total urban population of over 124,000 of inhabitants.

1.3.2 Building database setup

Using the previous information and considering the urban population, the database of built areas, exposure values and typical occupancy levels for each of the different types of uses and each of districts, can be set up. A summary of the information included in the database is given in Table 1.5 to Table 1.8. The methodology used to calculate exposure values at national level is summarized in the Annex ERN-CAPRA T2.1-2.

Table 1.5
Distribution of built areas per district and building use group

ID District	District	ID	m² Built Infrastructure										
			Res LP (m²x10³)	Res MP (m²x10³)	Res HP (m²x10³)	Com (m²x10³)	Ind (m²x10³)	PriHealth (m²x10³)	PriEdu (m²x10³)	PubHealth (m²x10³)	PubEdu (m²x10³)	Gov (m²x10³)	Total (m²x10³)
1	Corozal	1	50.4	219.3	27.2	116.6	49.8	0.0	0.0	0.1	88.8	5.7	558
2	Orange Walk	2	55.1	343.8	57.2	136.4	75.8	0.1	26.4	0.3	105.5	5.9	806
3	Belize	3	92.5	743.0	164.1	453.7	151.7	0.6	137.8	0.5	137.8	24.9	1,906
4	Cayo	4	74.2	462.7	77.0	244.8	82.8	0.1	36.3	0.3	145.1	15.8	1,139
5	Stann Creek	5	38.3	166.5	20.7	102.0	45.2	0.0	0.0	0.2	69.7	5.0	447
6	Toledo	6	36.2	157.4	19.5	59.7	33.0	0.0	0.0	0.1	66.5	4.4	377
		Total	347	2,093	366	1,113	438	1	200	2	613	62	
				5,234									

Table 1.6
Distribution of exposure values per district and building use group

ID District	District	ID	Values of Structures										
			Res LP (US$x10⁵)	Res MP (US$x10⁵)	Res HP (US$x10⁵)	Com (US$x10⁵)	Ind (US$x10⁵)	PriHealth (US$x10⁵)	PriEdu (US$x10⁵)	PubHealth (US$x10⁵)	PubEdu (US$x10⁵)	Gov (US$x10⁵)	Total (US$x10⁵)
1	Corozal	1	3.96	34.44	6.41	18.31	11.73	0.00	0.00	0.02	13.94	0.89	90
2	Orange Walk	2	6.06	75.56	18.86	29.98	24.98	0.03	5.79	0.07	23.18	1.29	186
3	Belize	3	14.52	233.32	77.29	142.47	71.43	0.27	43.25	0.17	43.25	7.83	634
4	Cayo	4	8.15	101.69	25.38	53.80	27.30	0.04	7.97	0.09	31.89	3.48	260
5	Stann Creek	5	3.00	26.13	4.86	16.01	10.66	0.00	0.00	0.04	10.95	0.78	72
6	Toledo	6	2.84	24.72	4.60	9.38	7.77	0.00	0.00	0.02	10.44	0.70	60
	Total		39	496	137	270	154	0	57	0	134	15	
				1,302									

Table 1.7
Distribution of typical occupancy levels per district and building use group (day scenario)

ID District	District	ID	Occupancy of Structures (Day)										
			Res LP (Pop)	Res MP (Pop)	Res HP (Pop)	Com (Pop)	Ind (Pop)	PriHealth (Pop)	PriEdu (Pop)	PubHealth (Pop)	PubEdu (Pop)	Gov (Pop)	Total (Pop)
1	Corozal	1	1,517	7,545	819	5,597	896	0	0	2	5,683	1,043	23,103
2	Orange Walk	2	1,659	13,304	1,968	7,637	1,364	6	2,742	19	10,968	1,174	40,840
3	Belize	3	3,580	31,951	6,350	25,409	4,095	69	19,836	55	19,836	5,583	116,765
4	Cayo	4	2,232	17,905	2,648	13,708	1,491	8	3,772	24	15,090	3,168	60,046
5	Stann Creek	5	1,151	5,726	622	4,894	814	0	0	4	4,462	915	18,589
6	Toledo	6	1,089	5,415	588	2,868	594	0	0	2	4,257	817	15,631
	Total		11,228	81,847	12,995	60,112	9,254	83	26,350	108	60,296	12,700	
				274,974									

Table 1.8
Distribution of typical occupancy levels per district and building use group (night scenario)

ID District	District	ID	Occupancy of Structures (Night)										
			Res LP (Pop)	Res MP (Pop)	Res HP (Pop)	Com (Pop)	Ind (Pop)	PriHealth (Pop)	PriEdu (Pop)	PubHealth (Pop)	PubEdu (Pop)	Gov (Pop)	Total (Pop)
1	Corozal	1	3,528	17,547	1,905	2,099	498	0	0	2	0	0	25,580
2	Orange Walk	2	3,857	30,940	4,576	2,864	758	6	0	19	0	0	43,021
3	Belize	3	8,325	74,305	14,768	9,528	2,275	69	0	55	0	0	109,326
4	Cayo	4	5,191	41,640	6,158	5,141	828	8	0	24	0	0	58,990
5	Stann Creek	5	2,678	13,316	1,446	1,835	452	0	0	4	0	0	19,732
6	Toledo	6	2,532	12,594	1,368	1,075	330	0	0	2	0	0	17,902
	Total		26,113	190,342	30,222	22,542	5,141	83	0	108	0	0	
				274,551									

1.4 Urban infrastructure database

1.4.1 *Methodology and scope*

With the objective of identifying the exposure value of the urban infrastructure in the country, and using the inventory of the urban centres completed for each of the district, an estimation of the coverage of public utilities and valuation of networks (water, sewage, and telecommunications), bridges, airports and ports is carried out.

The public utilities and transport infrastructure coverage is estimated using the information included in the housing census classified in the following categories:

    (a) Bridges in urban areas
    (b) Airports

(c) Ports
(d) Energy substations and adjacent network
(e) Telecommunication substations and antennas
(f) Water and sewage network
(g) Water treatment plants
(h) Gas network.

In case that the necessary information is not available in the housing census, the estimation is carried out according to the typical values of other countries in the region based on the level of complexity of the district and the population density and coverage level of each of these services.

1.4.2   *Urban infrastructure database setup*

The available information allows the consolidation of all the data related to transport and public utilities infrastructure in urban centres, so as to estimate the exposure values in each of the sectors analyzed. Table 1.9 presents the results of this estimation.

Table 1.9
Exposure values of transportation systems, public services and networks

ID District	District	ID	Airports				Ports				Bridges	
			m² Const	Const. Value	km Airstrip	Value of Airstrip	m² Const	Const. Value	m² Wharf	Value of Wharf	Num. Bridges	Value
			(m²)	(US$x10⁶)	(km)	(US$x10⁶)	(m²)	(US$x10⁶)	(m²)	(US$x10⁶)	Und	(US$x10⁶)
1	Corozal	1	10,000	6.00	3.3	8.17	0	0.00	0	0.00	0	0.00
2	Orange Walk	2	20,000	20.00	0.6	3.05	0	0.00	0	0.00	1	0.65
3	Belize	3	50,000	100.00	4.3	43.36	15,446	15.45	10,692	32.08	6	12.30
4	Cayo	4	0	0.00	0.0	0.00	0	0.00	0	0.00	1	0.73
5	Stann Creek	5	10,000	6.00	3.4	8.42	3,925	2.35	2,280	2.28	0	0.00
6	Toledo	6	10,000	6.00	0.7	1.71	0	0.00	0	0.00	0	0.00
	Total		100,000	138	12	65	19,371	18	12,972	34	8	14

Table 1.9
Exposure values of transportation systems, public services and networks (second part)

ID District	District	ID	Electric Substations	Communication Substations	Dams	Plants and tanks	Networks		
							Aqueducts	Sewage systems	Gas networks
			(US$x10⁶)	(US$x10⁶)	(US$x10⁶)	(US$x10⁶)	(US$x10⁶)	(US$x10⁶)	(US$x10⁶)
1	Corozal	1	0.05	0.03	0.00	0.02	0.03	0.06	0.04
2	Orange Walk	2	0.69	0.34	0.00	0.09	0.19	0.30	0.21
3	Belize	3	5.40	2.88	0.00	0.83	1.19	2.61	1.33
4	Cayo	4	1.20	0.60	0.00	0.16	0.33	0.52	0.37
5	Stann Creek	5	0.06	0.03	0.00	0.02	0.04	0.07	0.05
6	Toledo	6	0.03	0.01	0.00	0.01	0.02	0.03	0.02
	Total		7	4	0	1	2	4	2
			288						

1.5   National infrastructure database

1.5.1   *Methodology and scope*

The inventory of information collected at the district and urban centres level together with the information related to the access to the different type of services, was used to quantify

the value of infrastructure exposed at a national level. Based on this, an estimation of the services coverage and an assessment of infrastructure components such as hydroelectric power plants, national telecommunications network, pipelines and national road network, was performed.

The national infrastructure is then classified in the following categories:

(a) Main Road Network
(b) Secondary Road Network
(c) Hydroelectric Power Plants
(d) Dams
(e) Thermal Power Plants
(f) Energy Substations and Networks
(g) Telecommunications Substations and Antennas
(h) Fuel and Gas Substations and Networks

The assignment of values to the infrastructure previously described is done through the estimation of the population that has coverage of the services corresponding to each type of infrastructure, the country's energy production, the amount of fixed and mobile phone lines, and the level of exploitation of hydrocarbons. These values are then distributed geographically in relation to the population density and the production centres.

1.5.2 *National infrastructure database setup*

The available information allows the consolidation of all the data related to national transport and public utilities infrastructure, so as to estimate the exposure values in each of the sectors analyzed. Table 1.10 and Table 1.11 present the results of this estimation.

Table 1.10
Exposure values of national roads

ID District	District	ID	Primary Roads		Secondary Roads		Primary Roads		Secondary Roads	
			km of road	Value of Roads	km of road	Value of Roads	km of bridges	Value of bridges	km of bridges	Value of bridges
			(km)	(Cost US$ x 10^6)	(km)	(Cost US$ x 10^6)	(km)	(Cost US$ x 10^6)	(km)	(Cost US$ x 10^6)
1	Corozal	1	0.00	0.00	48.31	15.70	0.00	0.00	0.00	0.00
2	Orange Walk	2	322.00	837.21	191.81	62.34	0.74	14.82	0.12	1.87
3	Belize	3	83.03	215.87	163.30	53.07	0.48	9.57	0.26	3.97
4	Cayo	4	259.80	675.48	118.45	38.50	1.25	24.91	0.16	2.40
5	Stann Creek	5	115.34	299.88	120.76	39.25	0.96	19.26	0.28	4.26
6	Toledo	6	282.71	735.05	127.26	41.36	1.25	25.01	0.16	2.38
		Total	1,063	2,763	770	250	5	94	1	15
				3,122						

Table 1.11
Exposure values of national infrastructure

ID District	District	ID	Power generation				Energy distribution		Communications		Hydrocarbons	
			Hydroelectric infrastructure		Power Plants							
			Dam	Power houses	Thermal	Geothermal	Substations	Power lines	Fixed lines	Mobile lines	Derivatives	Gas
			(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)	(US$ x 10⁶)
1	Corozal	1	0.00	0.00	0.00	0.00	0.33	0.33	0.15	0.00	0.00	1.42
2	Orange Walk	2	0.00	0.00	0.00	0.00	0.36	0.36	0.16	0.00	0.00	1.81
3	Belize	3	0.00	0.00	0.00	0.00	0.70	0.70	0.43	0.00	100.00	3.38
4	Cayo	4	0.00	0.00	0.00	0.00	0.44	0.44	0.23	0.00	0.00	2.48
5	Stann Creek	5	0.00	0.00	0.00	0.00	0.21	0.21	0.09	0.00	0.00	1.11
6	Toledo	6	0.00	0.00	0.00	0.00	0.11	0.11	0.04	0.00	0.00	0.58
		Total	0	0	0	0	2	2	1	0	100	11
				116								

1.6   General summary of exposure indicators

The information collected for each of the sections previously presented is organized and classified in a spread sheet (See Annex ERN–CAPRA-T2.1-3), where all the data related to district, population, buildings, urban and national infrastructure can be found. This spread sheet includes also a summary of the different indexes of the country and the exposure values of each of the assets estimated. Table 1.12 and Table 1.18 present a summary of the final values for the indexes and physical, economical and human exposure.

Table 1.12
Indicators and general parameters

Indicator	Unit	Value
Total population	Pop	274,587
Urban population	Pop	124,526
Rural popultion	Pop	150,061
Minimum wage	US$	157
GDP (2008)	US$Billon	2.3
GDP PER CAPITA (2008)	US$	7,800

Table 1.13
Construction area and density

Constructions	Unit	Value	Unit	Value per capita
Urban built area	m²	5,234 x10³	m²/Pop	19.062
Density of urban constructions	m²/m² urban lands	0.15	-	-

Table 1.14
Economic value of infraestructure

Infrastructure	Unit	Economic value	Unit	Economic value per capita	Economic value per capita / GDP per capita	Relative share
Urban constructions	US$x10⁶	1,302	US$/Pop	4,742	0.61	27.0%
Rural constructions	US$x10⁶	-	US$/Pop	-	-	-
Urban infrastructure	US$x10⁶	288	US$/Pop	1,050	0.13	6.0%
National infrastructure	US$x10⁶	3,238	US$/Pop	11,793	1.51	67.1%
Total Infrastructure for the country	**US$x10⁶**	**4,829**	**US$/Pop**	**17,585**	**1.30**	**100.0%**

Table 1.15
Construction area and economic value of urban structures

Use group	Construction area $[m^2 x10^3]$	Economic value $[US\$x10^6]$	Construction area / population from use group	
			Unit	Value
Residential LP	347	38.5	m^2/Pop LP	4
Residential MP	2,093	495.9	m^2/Pop MP	13
Residential HP	366	137.4	m^2/Pop HP	23
Commercial	1,113	269.9	m^2/WF	20
Industry	438	153.9	m^2/WF	50
Private Health	1	0.34	m^2/1000 Pop	3
Private Education	200	57.0	m^2/Stud	2
Public Health	2	0.42	m^2/1000 Pop	6
Public Education	613	133.7	m^2/Stud	7
Government	62	15.0	m^2/PE	5
Total	**5,234**	**1,302.0**	**m^2/Urban Pop**	**42**

Table 1.16
Ocupation depending on use groups and day or night scenarios

Use group	Occupancy Day [Population]	Occupancy Night [Population]
Residential LP	11,228	26,113
Residential MP	81,847	190,342
Residential HP	12,995	30,222
Commercial	60,112	22,542
Industry	9,254	5,141
Private Health	83	83
Private Education	26,350	0
Public Health	108	108
Public Education	60,296	0
Government	12,700	0
Total	**274,974**	**274,551**

Table 1.17
Urban infrastructure value

Sector	Quantity		Urban quantity per capita	Economic value [US$x10^6]	Urban economic value per capita [US$ / Pop]	Economic value / Quantity	
	Unit	Value				Unit	Value
Electric Substations	-	-	-	7	60	-	-
Communication Substations	-	-	-	4	31	-	-
Dams	-	-	-	0	0	-	-
Plants and tanks	-	-	-	1	9	-	-
Aqueducts	-	-	-	2	14	-	-
Sewage systems	-	-	-	4	29	-	-
Gas networks	-	-	-	2	16	-	-
Airports (Terminal)	m^2	100,000	803.0	138	1,108	US$/m²	1,380
Airports (Airstrips)	km	12	0.1	65	520	US$x10^6/km	5
Ports (Cellars)	m^2	19,371	155.6	18	143	US$/m²	919
Ports (Wharfs)	m^2	12,972	104.2	34	276	US$/m²	2,649
Urban Bridges	Unit	8	0.1	14	110	US$x10^6/Unit	2
Total	**-**	**-**	**-**	**288**	**2,316**		

Table 1.18
National infrastructure value

Sector	Quantity		Economic value [US$x10^6]	National economic value per capita [US$ / Pop]	Economic value / Quantity [US$x10^6/km]
	Unit	Value			
Main roads (Roads)	km	1,063	2,763	10,064	2.6
Secondary roads (Roads)	km	770	250	911	0.325
Main roads (Bridges)	km	5	94	341	20
Secondary roads (Bridges)	km	1	15	54	15
Hydroelectric infrastructure (Dams)	-	-	0	0	-
Hydroelectric infrastructure (Power houses)	-	-	0	0	-
Thermal power plants	-	-	0	0	-
Geothermal power plants	-	-	0	0	-
Electric Energy distribution (Substations)	-	-	2	8	-
Electric Energy distribution (Power lines)	-	-	2	8	-
Communications (Fixed phone lines)	-	-	1	4	-
Communications (Mobile phone lines)	-	-	0.0	0	-
Hydrocarbons (Derivatives)	-	-	100	364	-
Hydrocarbons (Gas)	-	-	11	39	-
Total	**-**	**-**	**3,238**	**11,793**	**-**

1.7 Graphical representation of the model of exposure

To understand the relative distribution of the exposure values at geographical level and the distribution by economic, development and use sectors, the following paragraphs present the most important parameters of the model.

1.7.1 *Urban construction in funtion built area, value per distirct and use group*

Figure 1.3 to Figure 1.5 show the area (km²), the population and the population density (urban, rural, and total) for the 6 district of the country.
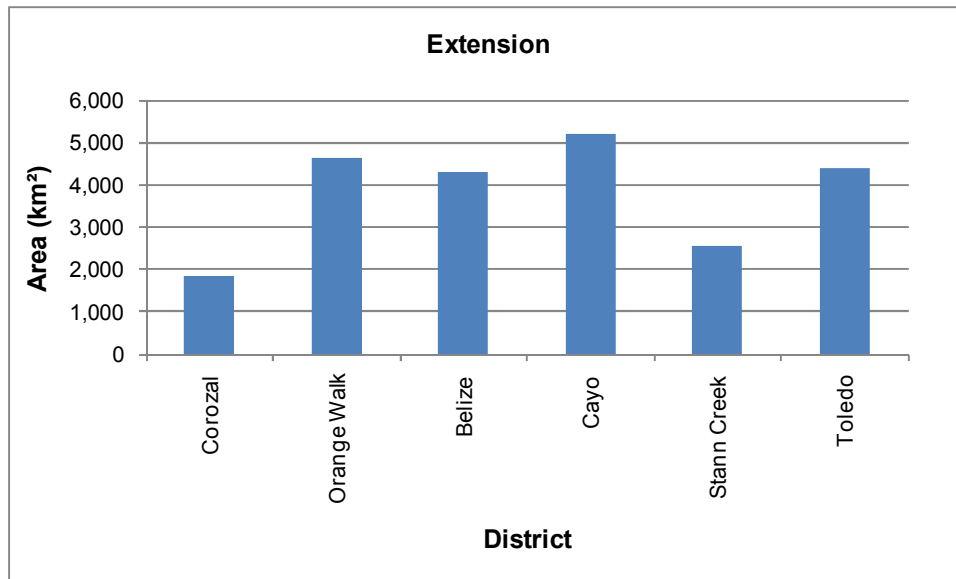
Figure 1.3
Area of the territory
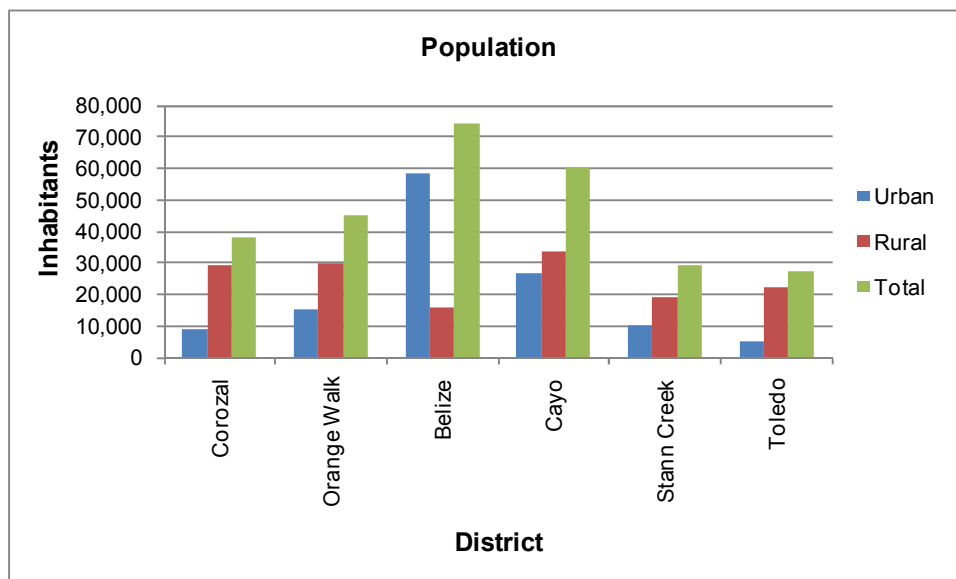
Figure 1.4
Population per district
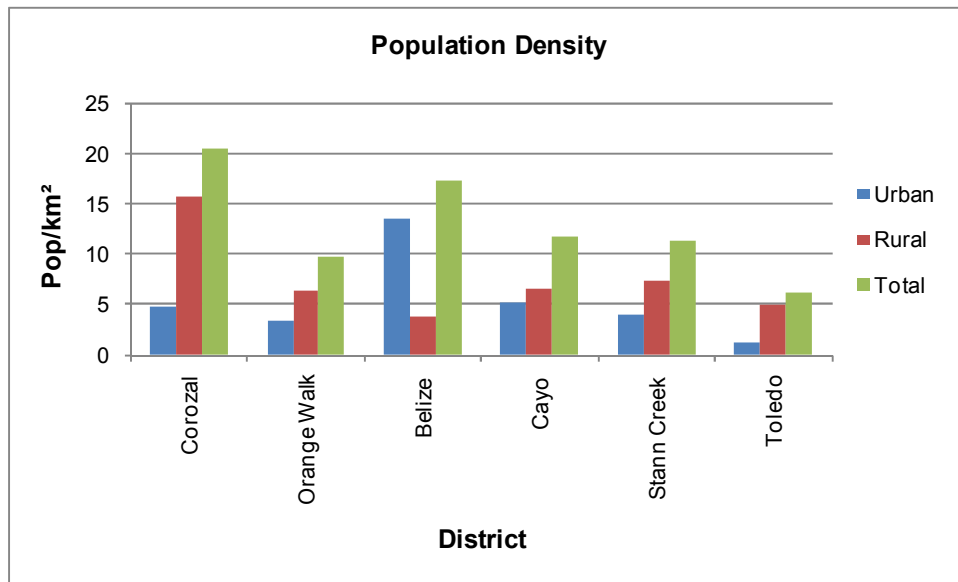
Figure 1.5
Population density per district

Figure 1.6 and Figure 1.7 show the estimated values of urban built area (m²) and exposure value for each district of the country.
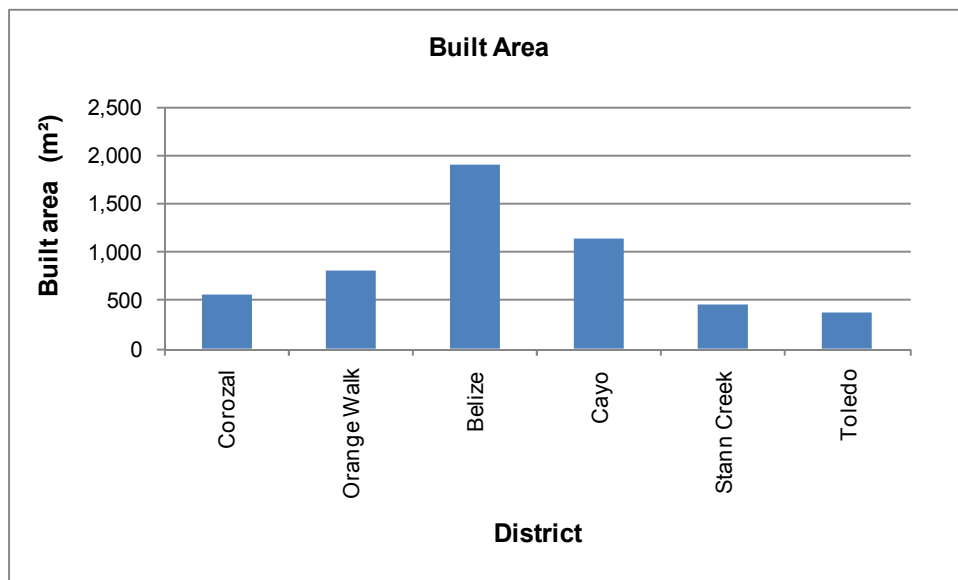
Figure 1.6
Urban built area per district
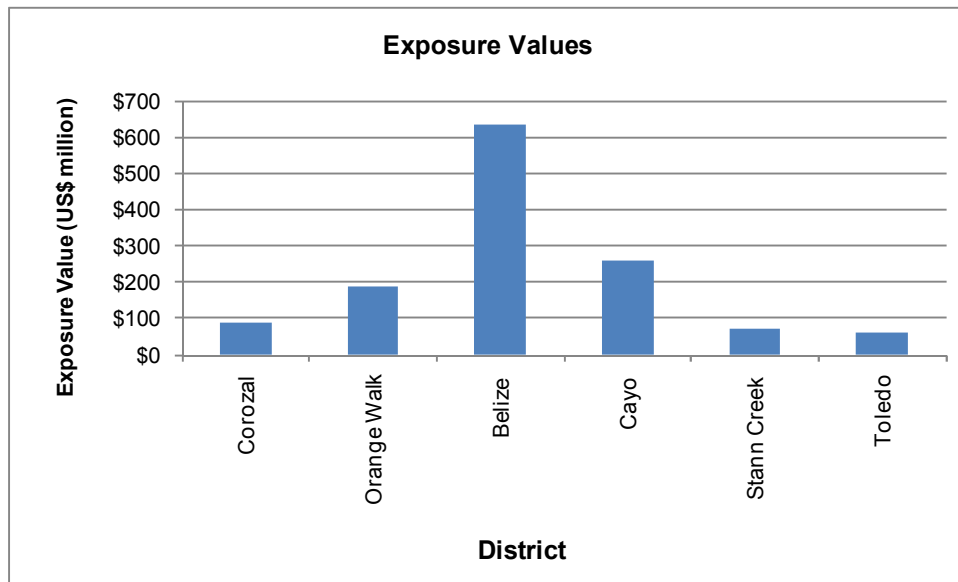
Figure 1.7
Exposure values of regular constructions per district

Figure 1.8 and Figure 1.9 show the information about approximated built area and exposure values for the use sectors analyzed.
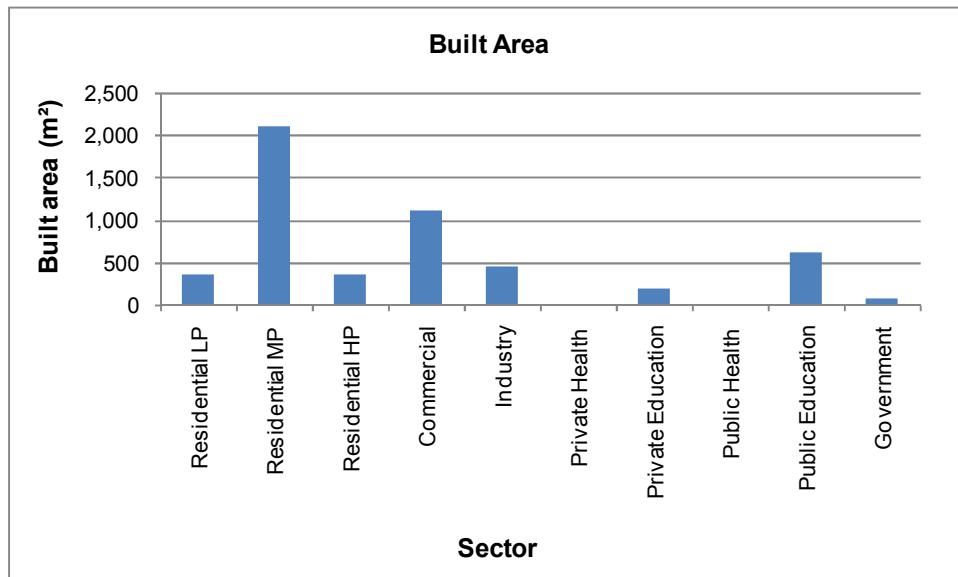
Figure 1.8
Built area per use group
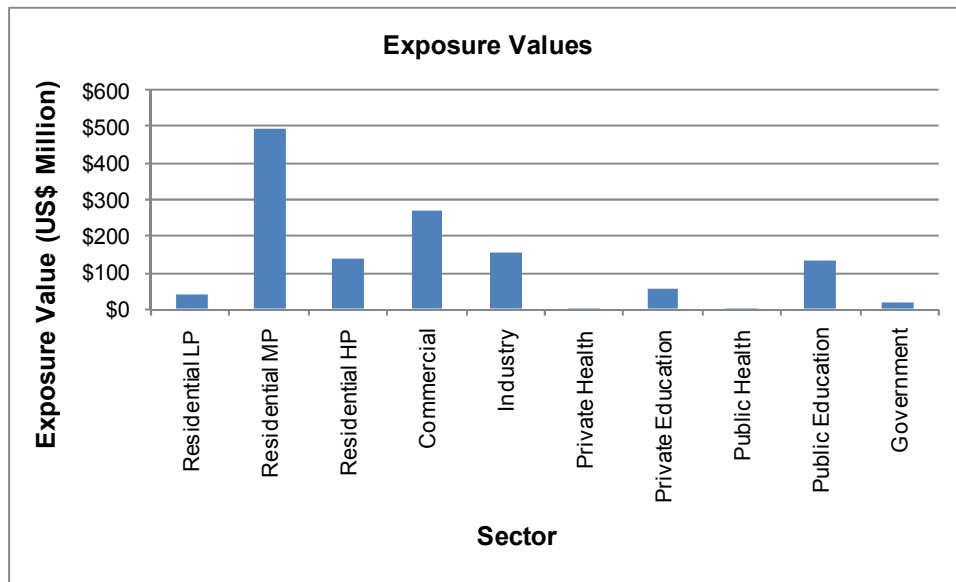
Figure 1.9
Exposure values per use group

The information showed above is combined to produce the following three-dimensional graphs (Figure 1.10 and Figure 1.11). The graphics show built areas and exposure values in accordance with the districts and the use sectors defined.
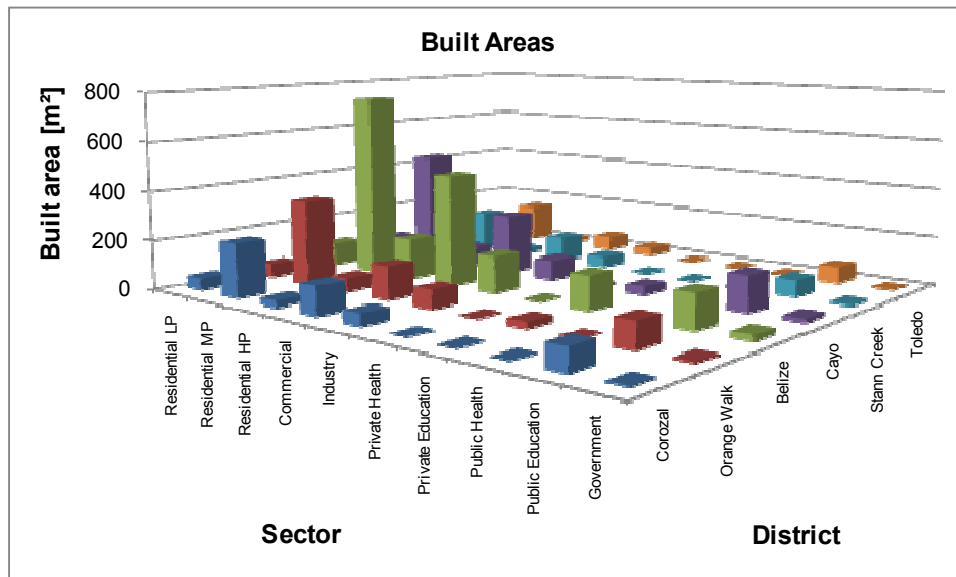
Figure 1.10
Built area per district and use group
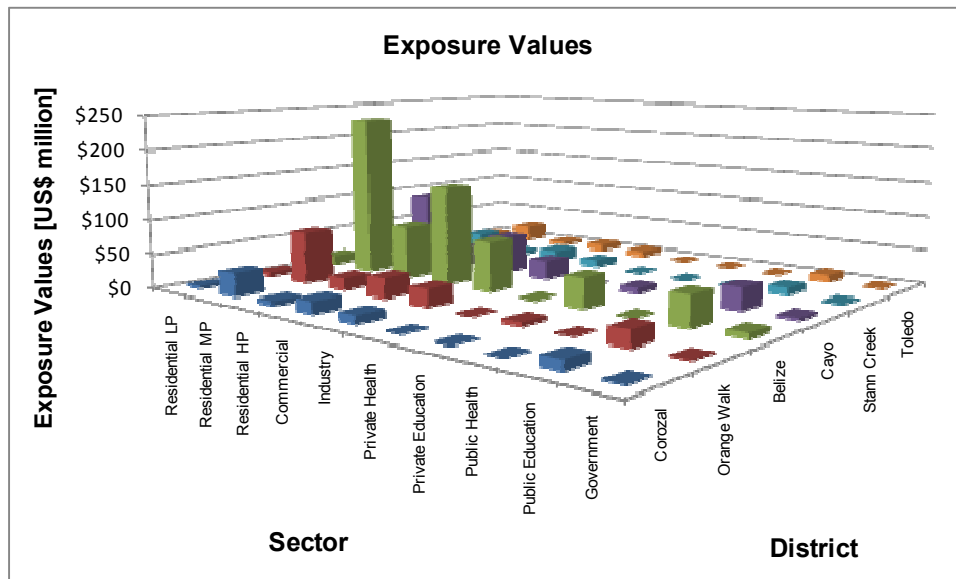
Figure 1.11
Exposure values per district and use group

1.7.2 *Urban infrastructure in funtion value per district and sector*

Figure 1.12 and Figure 1.13 show the exposure values of urban infrastructure, including ports, airports, power distribution systems, telecommunications, water and sewage systems, water treatment plants and gas systems. The information is showed per district and per sector.
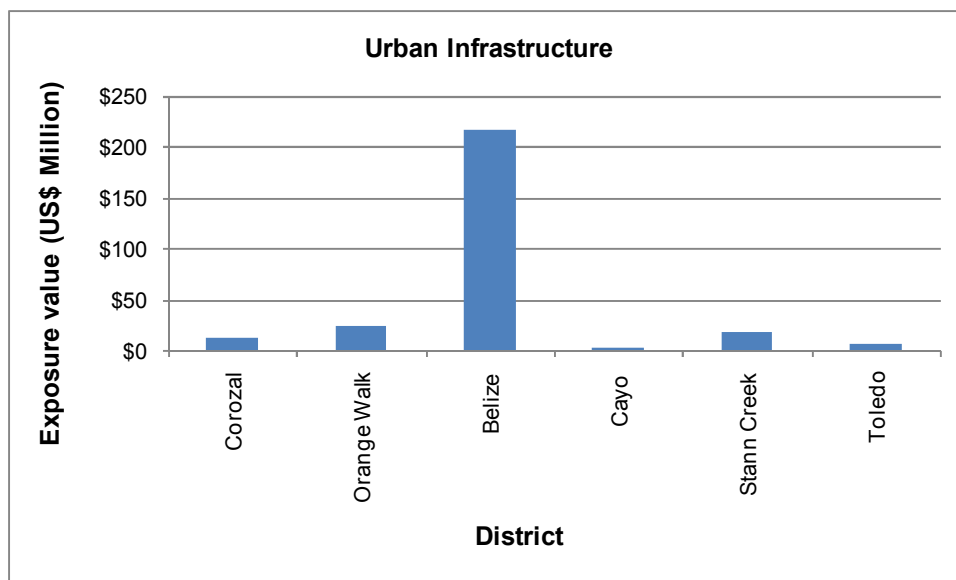
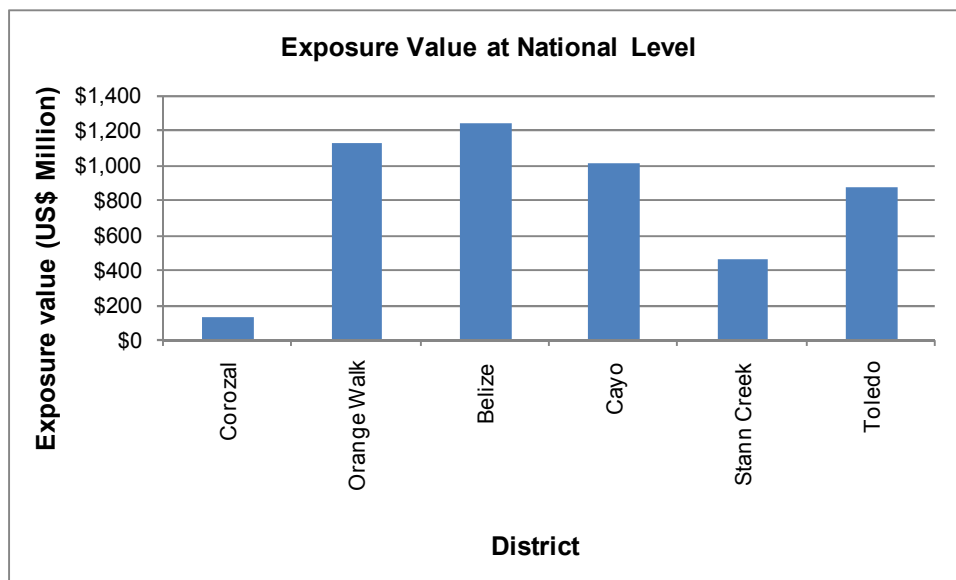*Figure 1.12*
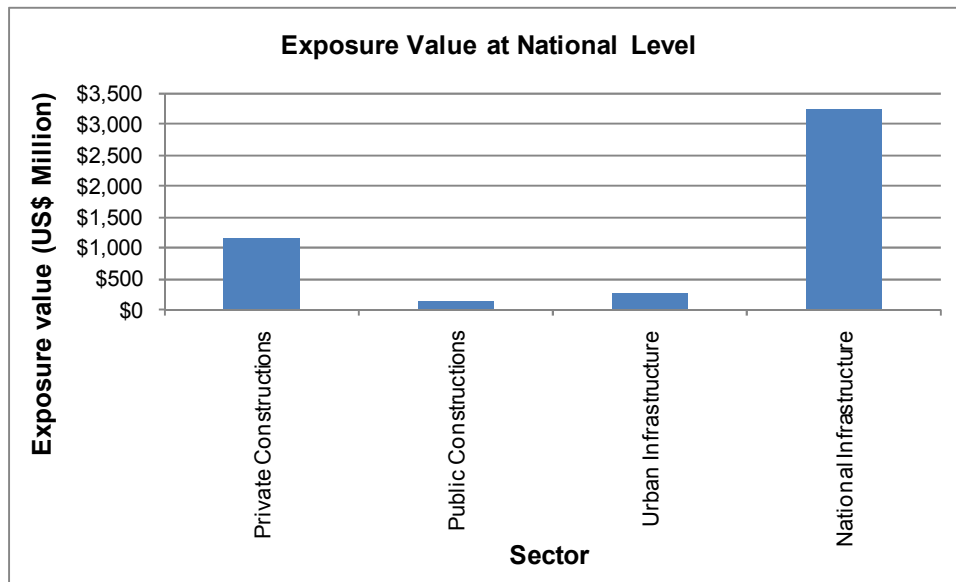*Exposure value of urban infrastructure per district*
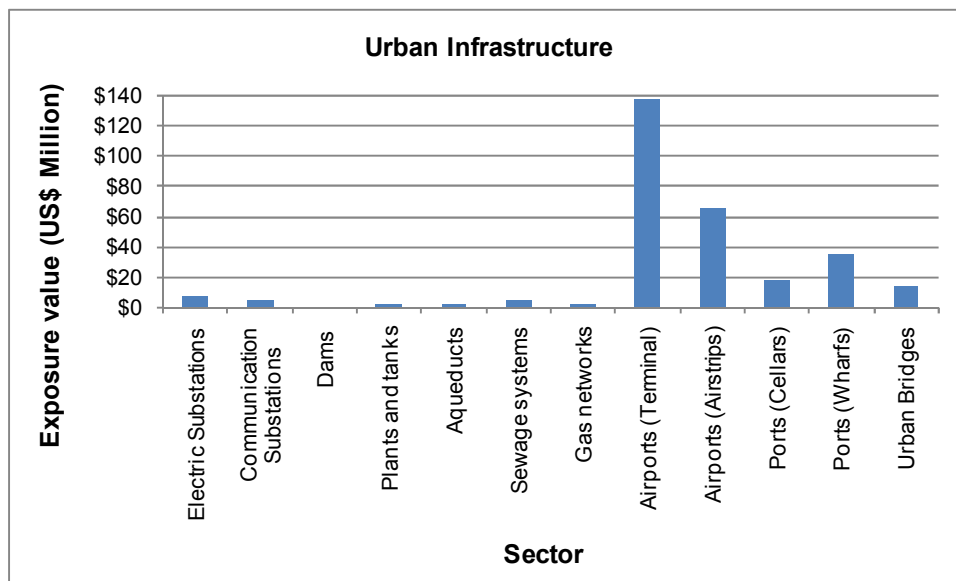
Figure 1.13
Exposure value of urban infrastructure per sector

Figure 1.14 shows the same information presented above in a three-dimensional graph.
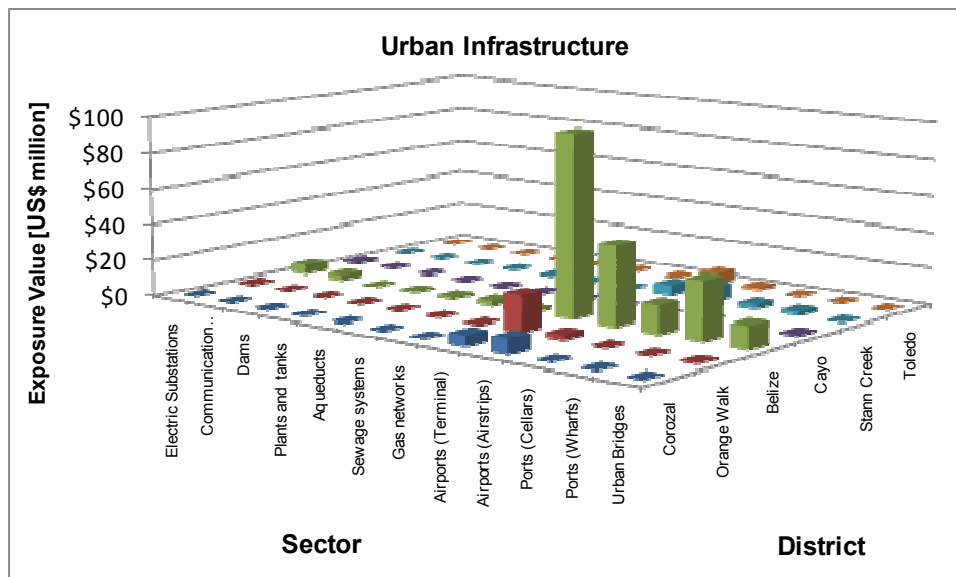
Figure 1.14
Exposure value of urban infrastructure per district and sector

1.7.3 *National infrastructure in funtion value per district and sector*

Figure 1.15 and Figure 1.16 show the exposure values for national infrastructure. This topic includes the main and secondary road network, bridges, hydroelectric power plants, dams,

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thermal power plants, power substations, telecommunications substations, fuel and gas substations and networks. The information is showed per district and per sector.
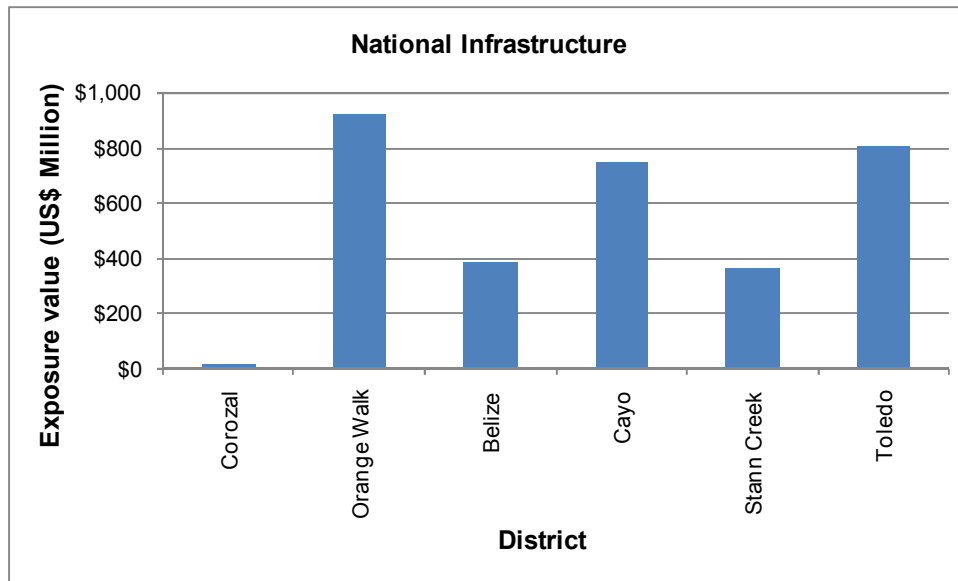
Figure 1.15
Exposure value of national infrastructure per district
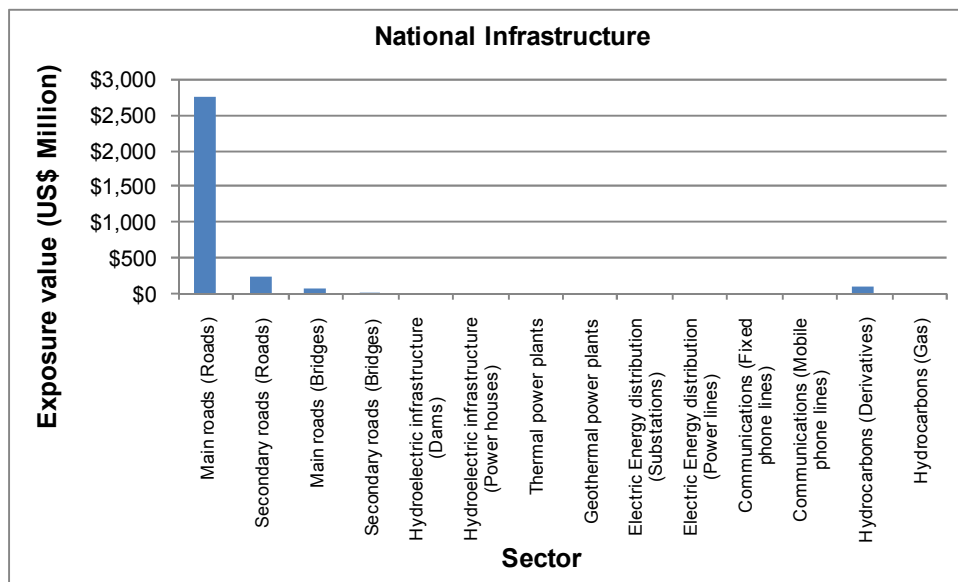
Figure 1.16
Exposure value of national infrastructure per sector

Figure 1.17 shows the same information presented above in a three- dimensional graph.
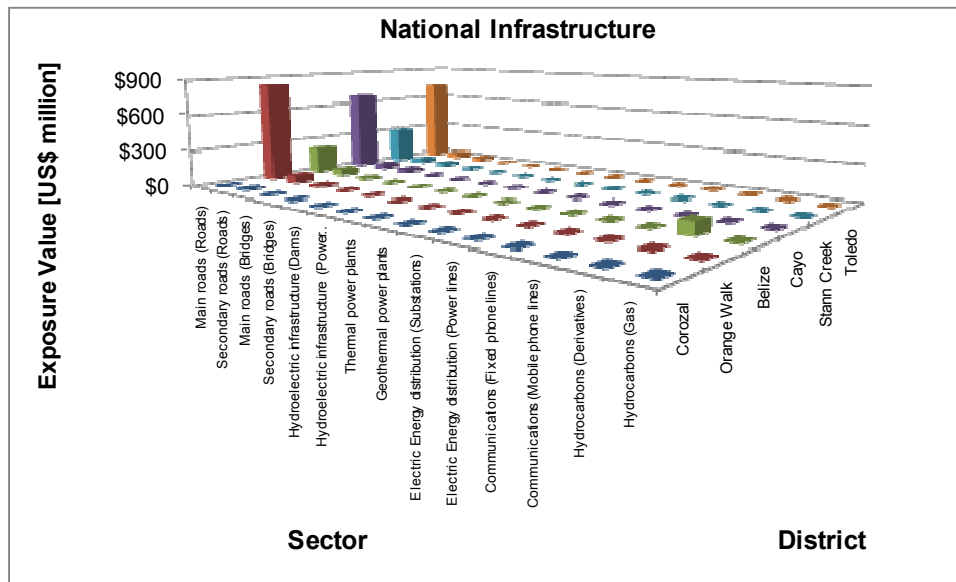
Figure 1.17
Exposure value of national infrastructure per district and sector

1.7.4 *Summary of total exposure values per district and sector*

Figure 1.18 and Figure 1.19 show the summary of the total exposure values obtained by the addition of urban buildings, urban and national infrastructure per each district and sector. In the categories of use sectors, all these types were considered.

Figure 1.18
Total exposure values of national infrastructure per district

Exposure Value at National Level

Figure 1.19
Total exposure value of national infrastructure per sector

Figure 1.20 shows the information presented above in a three-dimensional graph.

Exposure Value at National Level
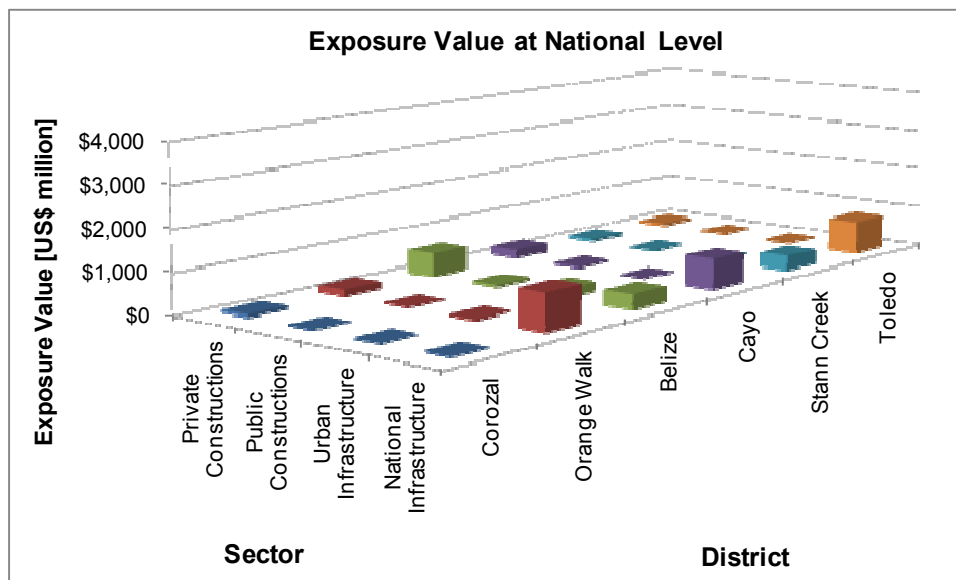
Figure 1.20
Total exposure value of national infrastructure per district and sector

La Figure 1.21 presents national exposed value for urban and rural buildings by sectors, urban and national infrastructure, and the total value for the country.
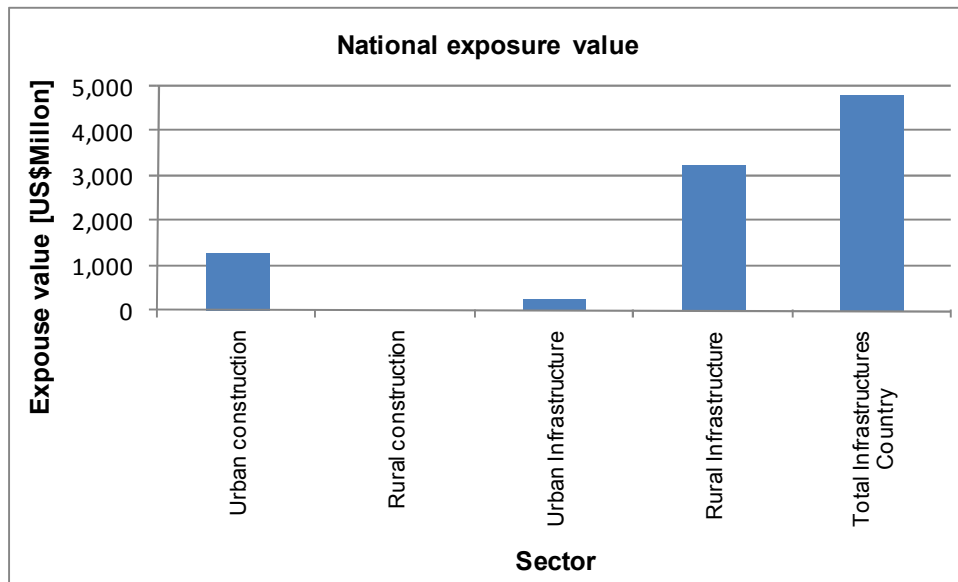
Figure 1.21
National exposed value per sector

1.7.5 *Information in descriptive maps*

Figure 1.22 to Figure 1.31 show the maps of information per district, for each of the following variables: population, distribution of built area and distribution of exposure value.
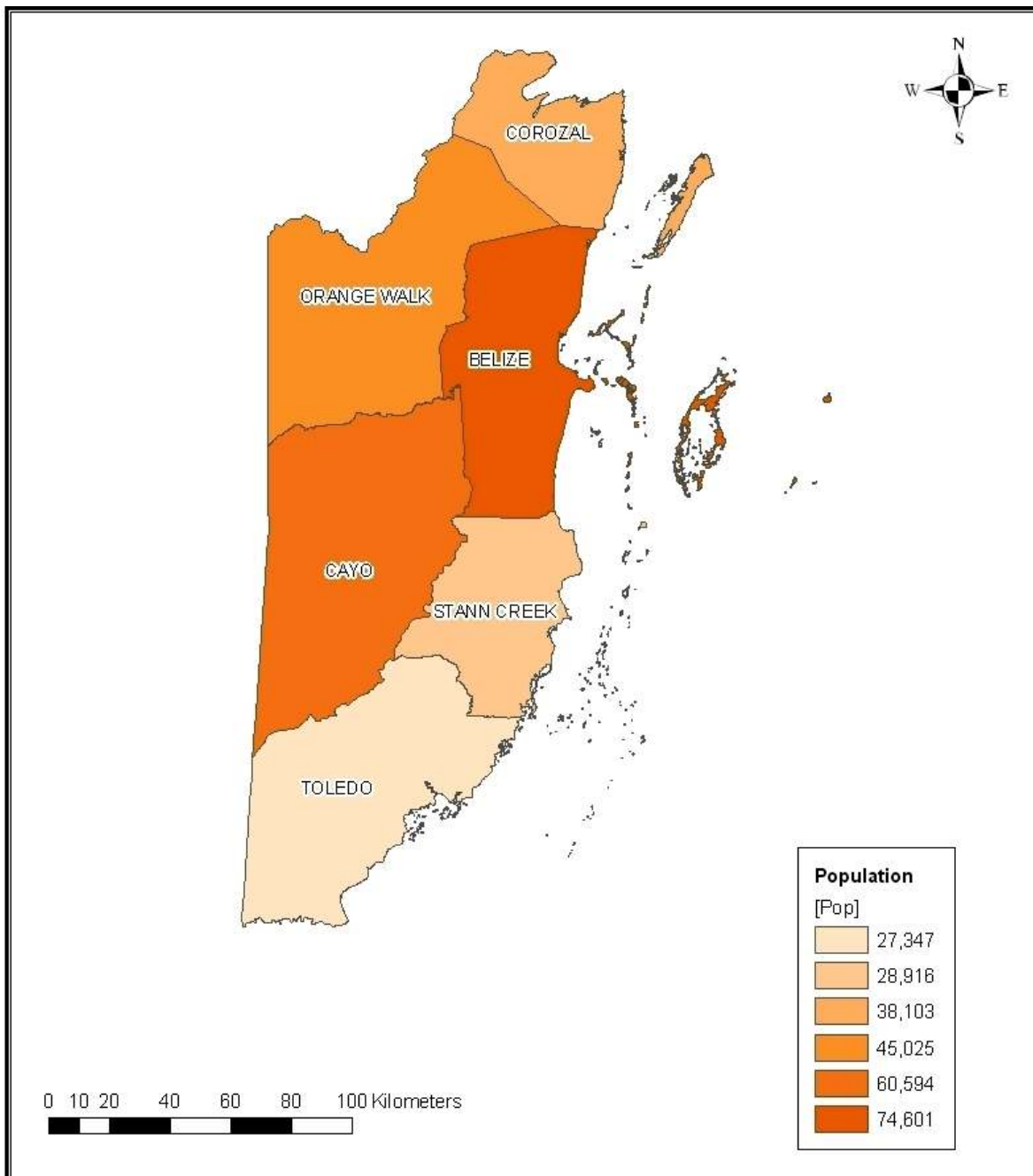
Figure 1.22
Population per district
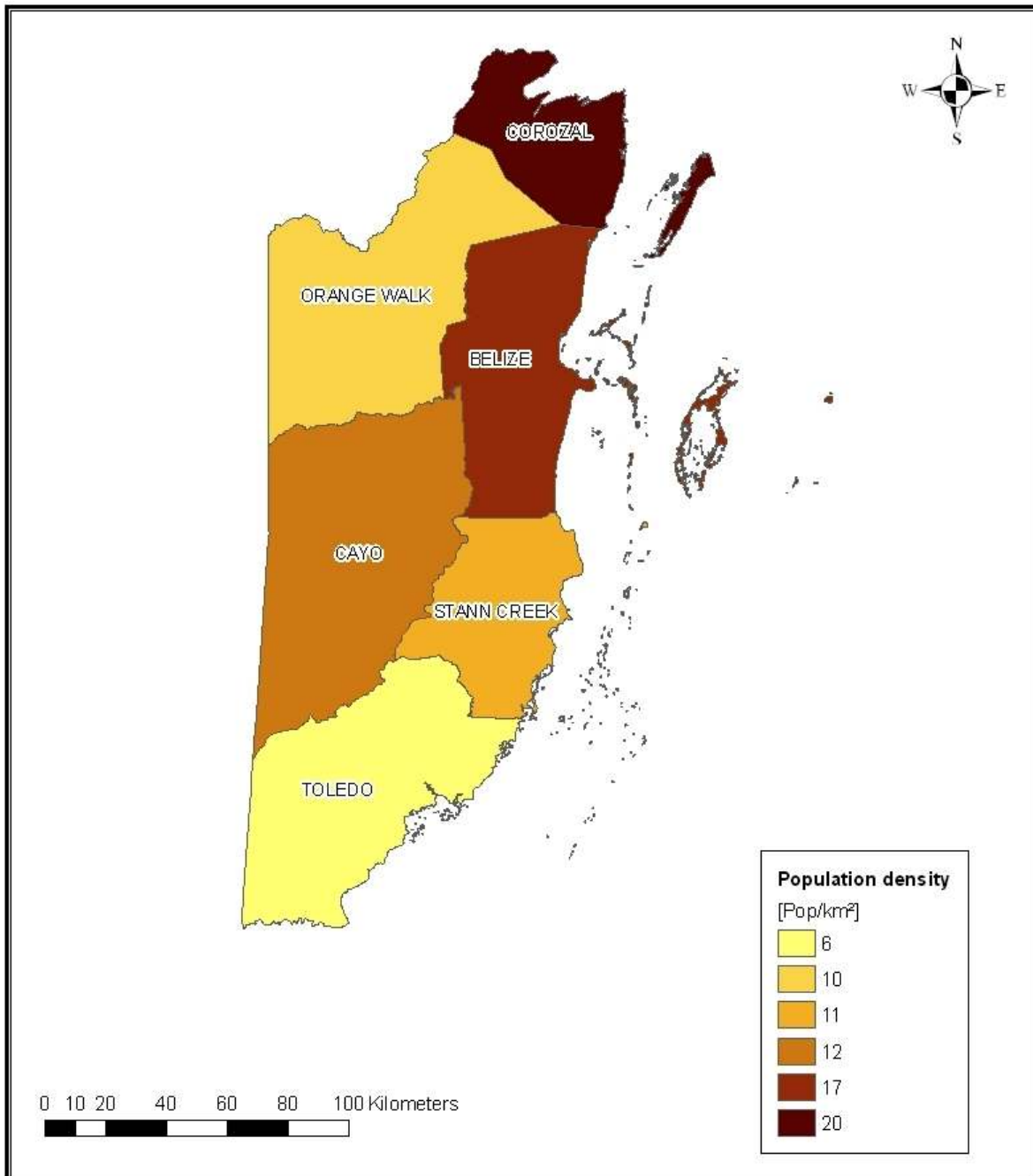
Figure 1.23
Population density per district
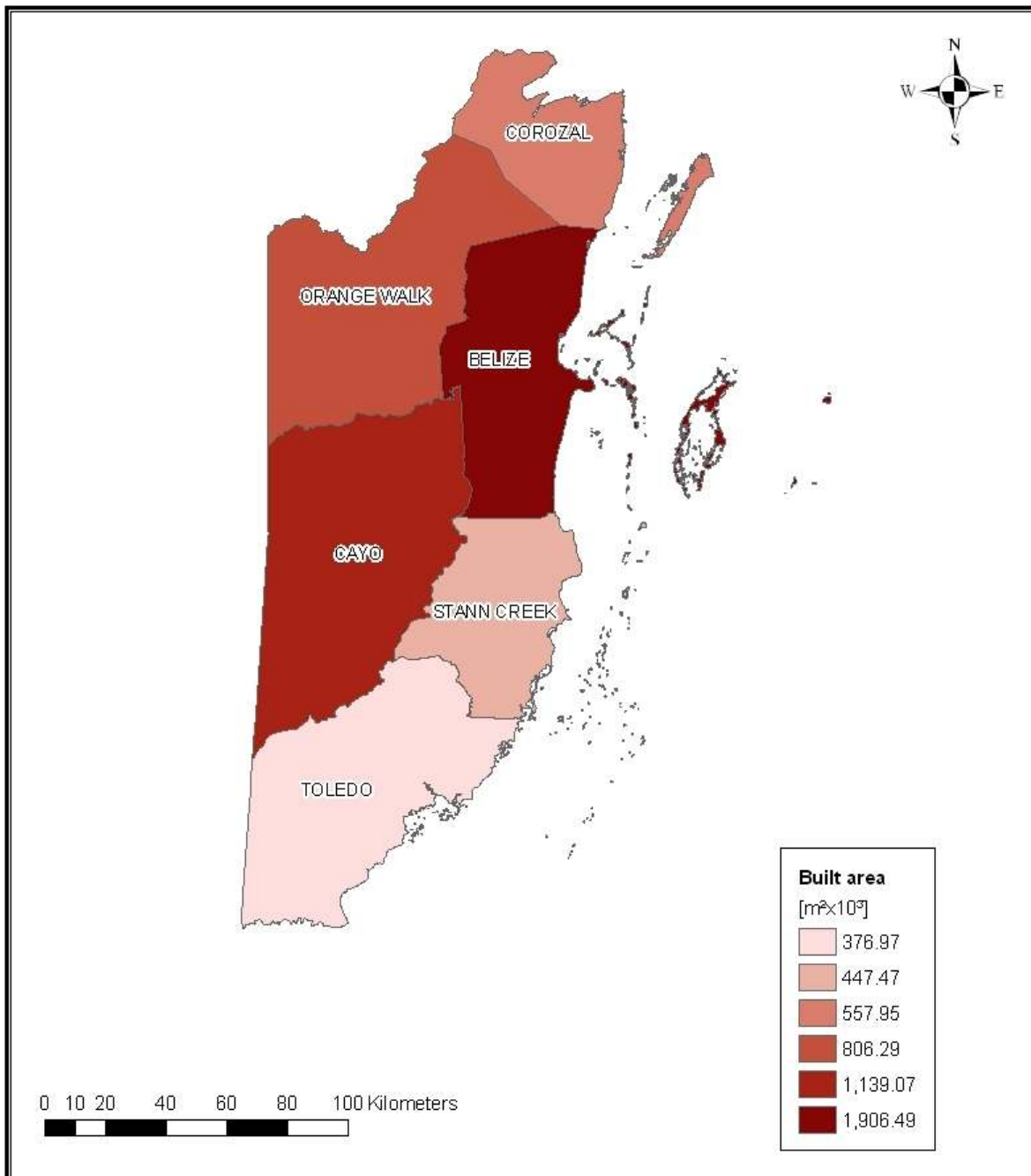
Figure 1.24
Built area per district
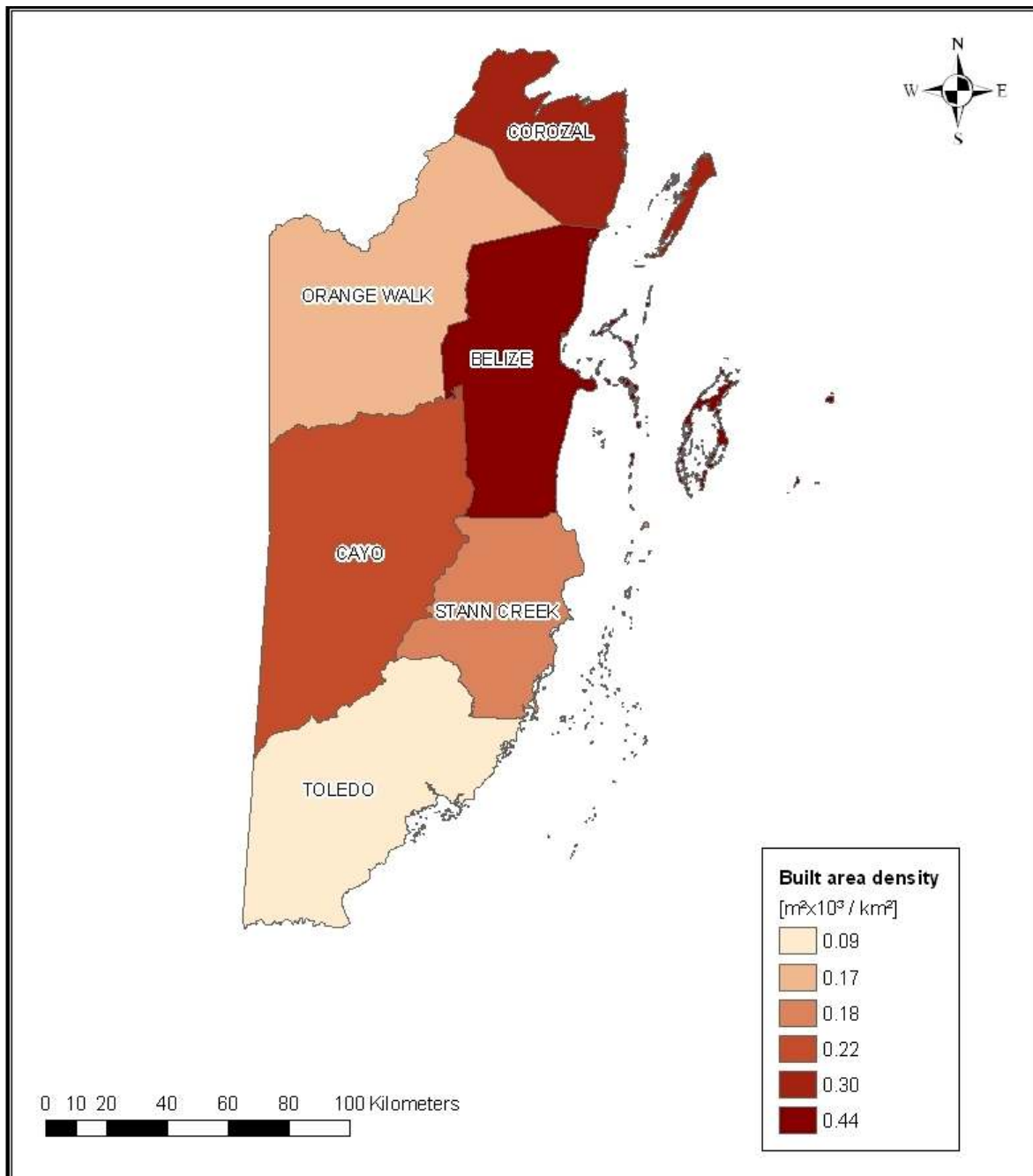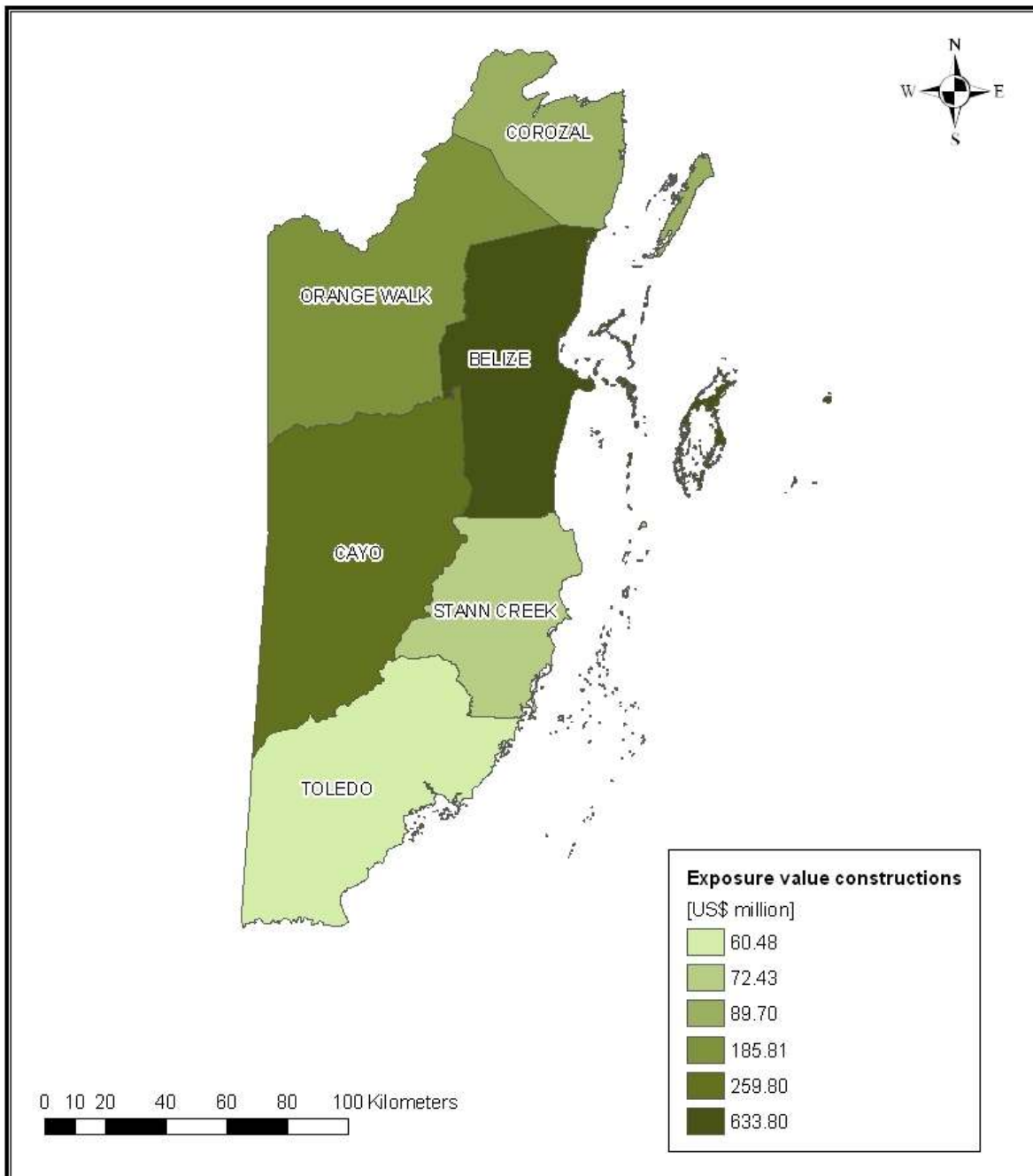
Figure 1.25
Built area density per district

Figure 1.26
Constructions exposure values per district
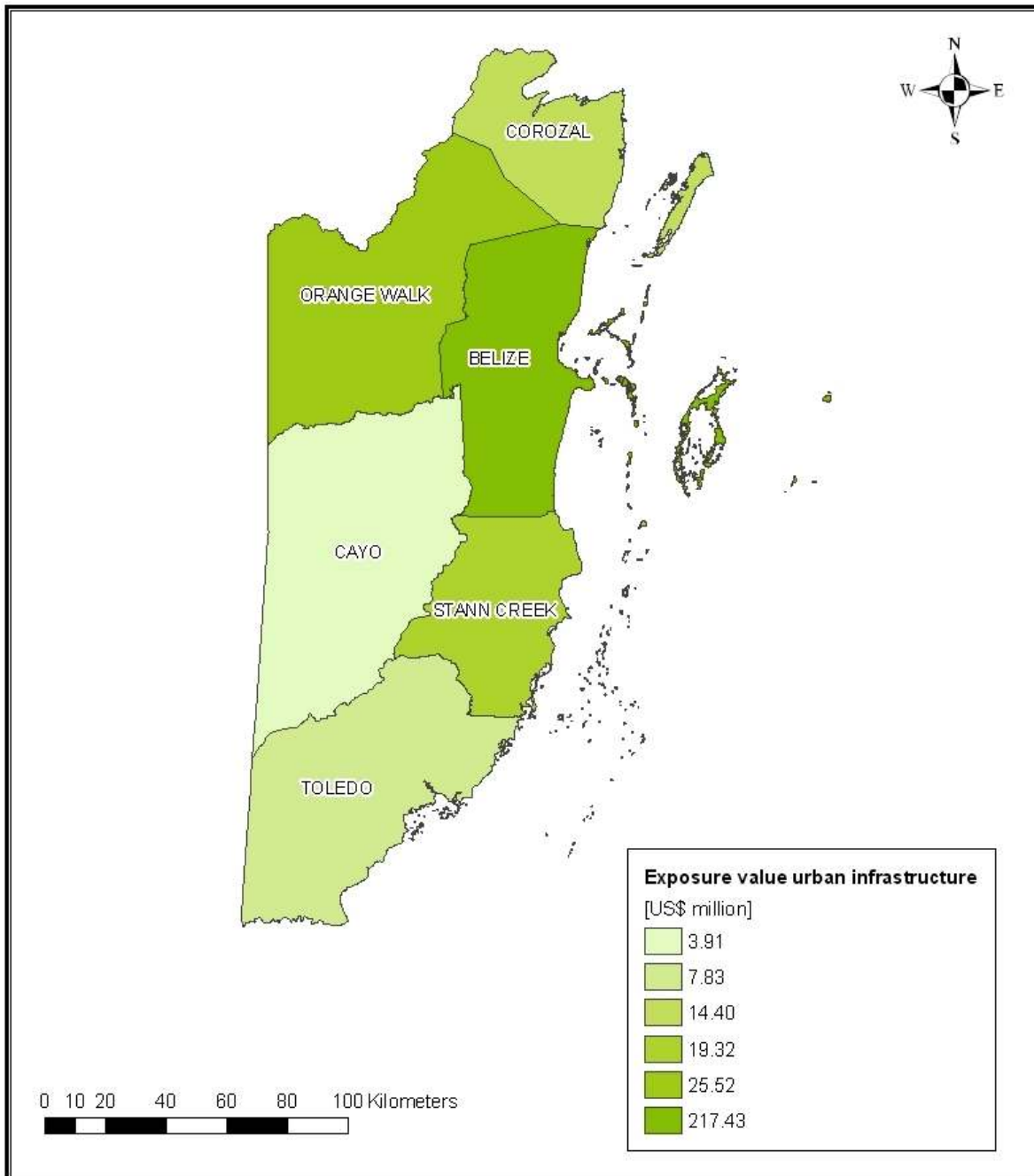
Figure 1.27
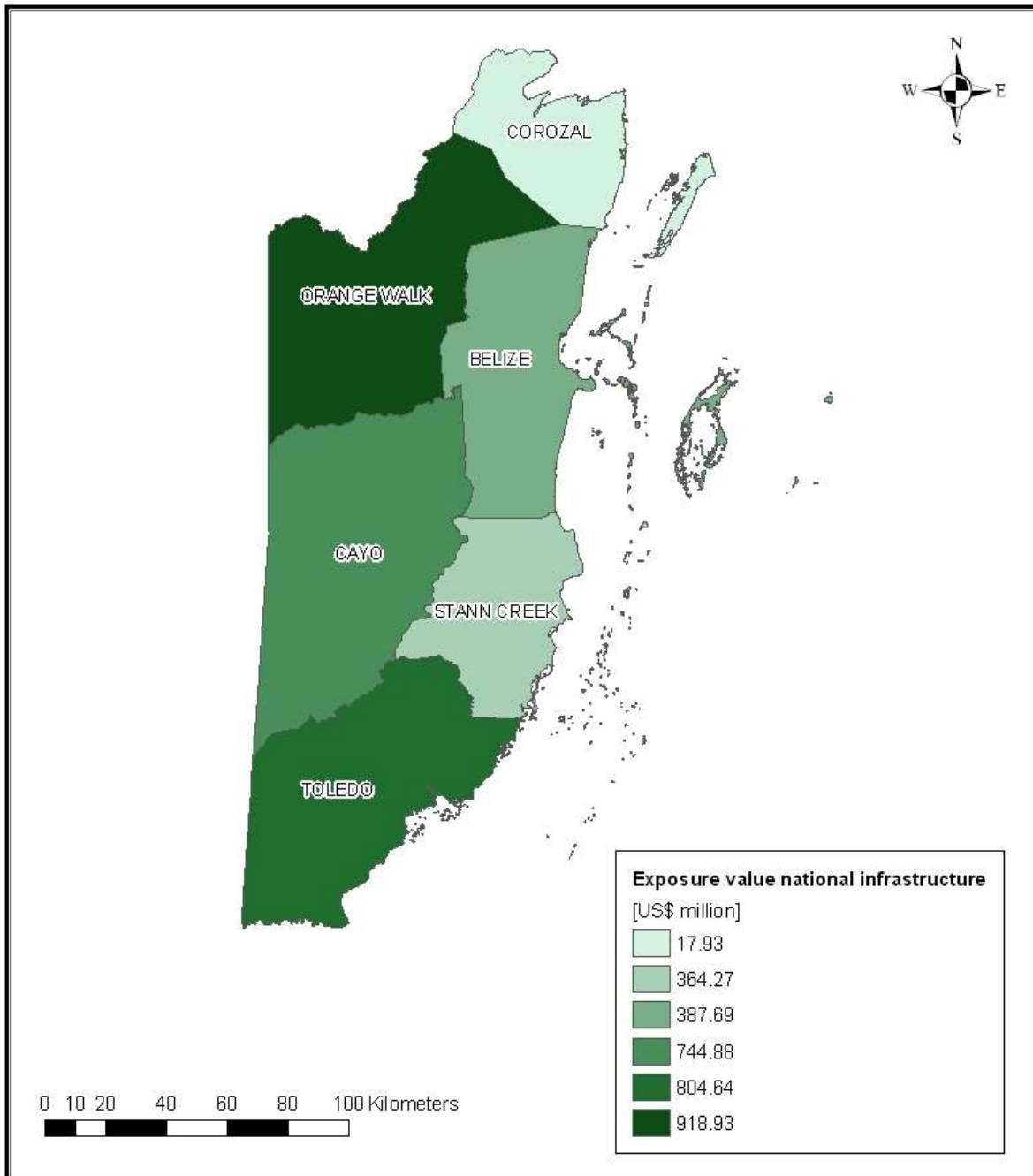*Urban infrastructure exposure value per district*

Figure 1.28
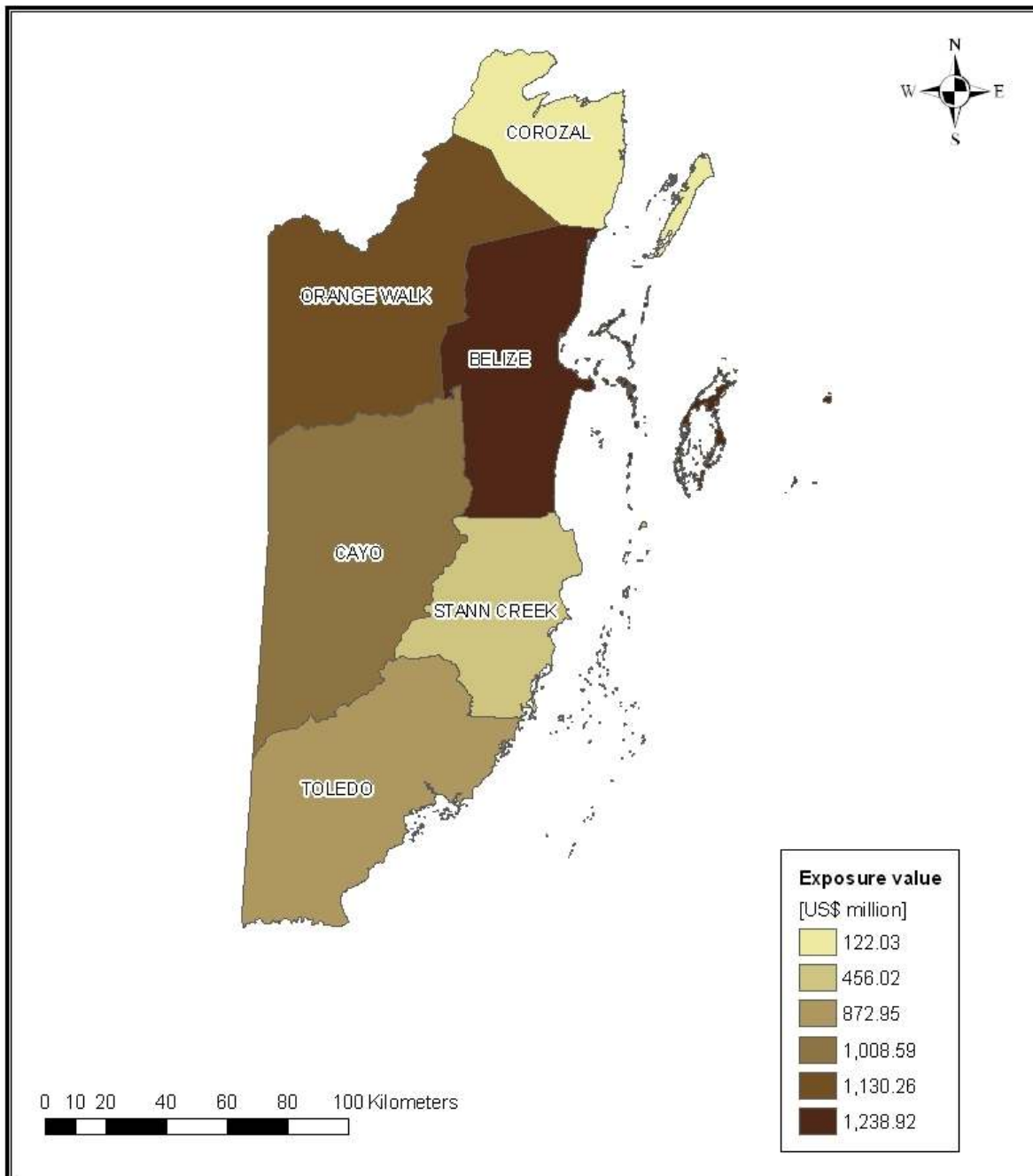*National infrastructure exposure value per district*

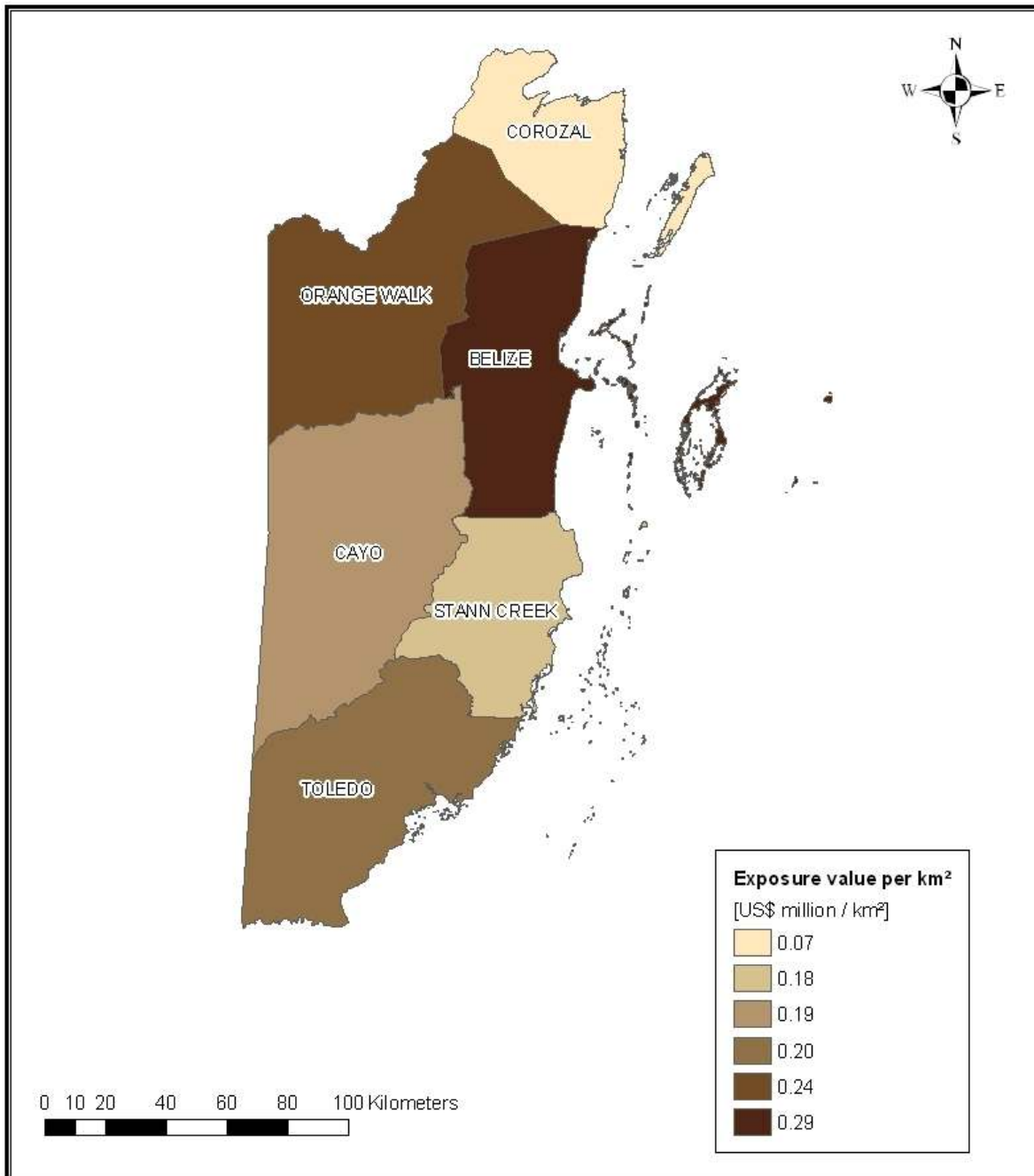*Figure 1.29*
Total exposure value per district

Figure 1.30
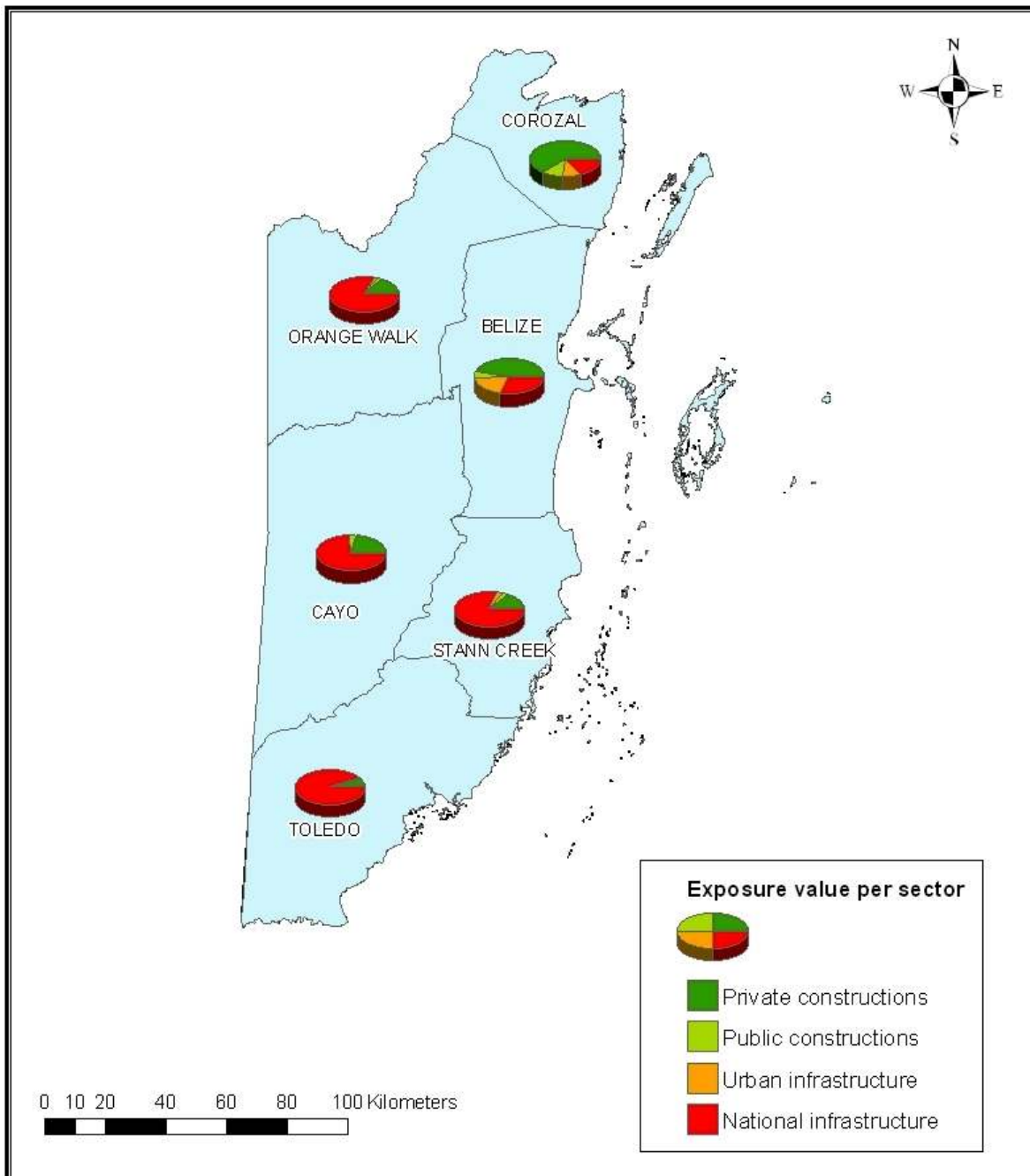*Exposure value per km²of area per district*

Figure 1.31
Relative distribution of exposure values for each sector per district

2   Main sources of information

- Statistical Institute of Belize (http://www.cso.gov.bz/)

- Economic Commission for Latin America and Caribbean (http://www.eclac.org/)

- Ministry of Health of Belize (http://www.hecopab@moh.org.bz)

- Central America Data (http://www.centralamericadata.com)

- Central Intelligence Agency, The World Factbook
  (https://www.cia.gov/library/publications/the-world-factbook/)

- http://www.presidencia.gov.co/sne/2005/mayo/14/05142005.htm

- http://www.invias.gov.co/invias/hermesoft/portalIG

- http://www.el-exportador.com/012002/mercados/n49_articulo.pdf

- http://www.inapa.gob.do/a,2707,html

- http://www.cig.gov.do/noticias/octubre-2006/05-10-06/gov-invi.html

- http://www.cepis.ops-oms.org/bvsade/cd/videos/Orosi%20Tecnico.pdf

- http://www.aircraft-charter-world.com/airports/centralamerica/honduras.htm

Annex ERN-CAPRA-T2.1-1
Exposure model diagram

Annex ERN-CAPRA-T2.1-2
Metodology for assessment of exposed elements

Annex ERN-CAPRA-T2.1-3
Exposure proxy value

(Annex digital. Annex file ERN-CAPRA-T2.1-3 - Proxy-Belice.xls)